Patent Claims

1. Al/Cu/Mg/Mn alloy for the production of semifinished products with high static and dynamic strength properties, **characterized in that** the alloy has the following composition:

0.3 – 0.7 wt. % silicon (Si)
maximally 0.15 wt. % iron (Fe)
3.5 – 4.5 wt. % copper (Cu)
0.1 – 0.5 wt. % manganese (Mn)
0.3 – 0.8 wt. % magnesium (Mg)
0.05 – 0.15 wt. % titanium (Ti)
0.1 – 0.25 wt. % zirconium (Zr)
0.3 – 0.7 wt. % silver (Ag)
maximally 0.05 wt. % other, individually
maximally 0.15 wt. % other, total
remaining wt. % aluminum (Al).

2. Alloy as claimed in claim 1, characterized **in that** the ratio of copper to magnesium is between 5 and 9.5.

3. Alloy as claimed in claim 2, **characterized in that** the copper content is 3.8 - 4.2 wt. % and the magnesium content 0.45 0.6 wt. % and the copper to magnesium ratio is between 6.3 and 9.3.

4. Alloy as claimed in one of claims 1 to 3, **characterized in that** the silver content is 0.45 – 0.6 wt. %.

5. Alloy as claimed in one of claims 1 to 4, **characterized in that** the silicon content is 0.4 - 0.6 wt. %.

6. Alloy as claimed in one of claims 1 to 5, **characterized in that** the manganese content is 0.2 – 0.4 wt. %.

7. Alloy as claimed in one of claims 1 to 6, **characterized in that** the zirconium content is 0.14 0.20 wt. %.

8. Alloy as claimed in one of claims 1 to 7, **characterized in that** the titanium content is 0.10 0.15 wt. %.

9. Alloy as claimed in one of claims 1 to 8, **characterized in that** the titanium component for the production of the alloy is alloyed into it in the form of an Al/Ti/B prealloy and the boron fraction is 0.01-0.03 wt. %.

10. Alloy as claimed in one of claims 1 to 9, **characterized in that** the iron content of the alloy is maximally 0.10 wt. %.

11. Semifinished product produced from an alloy as claimed in one of claims 1 to 10, **characterized in that** it is produced by a hot working process.

12. Method for the production of a semifinished product as claimed in claim 11, characterized by the following steps:
a) casting of an ingot from an alloy,
b) homogenizing the cast ingot at a temperature, which is as close under the incipient melting temperature of the alloy as is possible, for a length of time adequate to attain maximally uniform distribution of the alloy elements in the cast structure,
c) hot working of the homogenized ingot by forging and/or forging and/or rolling at temperatures between 320°C and 470°C,
d) solution treatment of the worked semifinished product at temperatures sufficiently high to bring the alloy elements necessary for the hardening into solution uniformly distributed in the structure, with the solution treatment taking place in a temperature range

between 490 and 505°C over a time period of 30 minutes to 5 hours,

e) quenching the solution-treated semifinished product either in water at a maximum temperature of 100°C or in a mixture of water and glycol at a temperature lower than or equal to 50°C, and

f) artificial ageing of the quenched semifinished product at temperatures between 170 and 210°C over a period of time of 5 hours to 35 hours.

13. Method as claimed in claim 12, **characterized in** that between the step of quenching and the step of artifical ageing a cold-working step is provided, in which the quenched semifinished product is upset or drawn out by an amount between 1 and 5% in order to reduce the intrinsic stresses.

14. Method as claimed in claim 12 or 13, **characterized in that** the step of artificial ageing is carried out over a time period of 10 and 25 hours.

Figures

Fig. 1 $X = T_{test}$

Fig. 2 $Y = \sigma$ fracture

a) Alloy E

b) $LMP = [(T_{test} + 273.15) * (20 + \log t_{fracture})] /1000$

Fig. 3 ....a) Alloy E

b) Test temperature (°C)

Fig. 4A a) Fatigue strength at ambient temperature

b) Maximum stress limit

c) Stress cycles endured

d) Alloy E

e) broken

f) not broken

g) Endurance limitation

h) Number of nonbroken samples

Fig. 4B a) Fatigue strength at T_{test} = 200 °C

otherwise identical to Fig. 4A